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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/501,501	06/28/2004	Christoph Gauer	298-248	8274

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EXAMINER	
KINGAN, TIMOTHY G	

ART UNIT	PAPER NUMBER
1797	

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02/05/2009	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/501,501	GAUER, CHRISTOPH	
	Examiner	Art Unit	
	TIMOTHY G. KINGAN	1797	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *19 November 2008*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-25* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-9 and 12-20* is/are rejected.

7)☒ Claim(s) *10,11 and 21-25* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *11/19/2008*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 11/19/2008 has been entered.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

4. Claims 1-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over A. Wixforth, U.S. Patent Application Publication 2001/0055529 (herein after Wixforth).

For Claim 1, Wixforth teaches applying a drop of liquid to a region **11** of the chip [0075], [0081]. Wixforth also teaches that drops of liquid being transported do not run away from each other (are held together) because of surface tension [0012].

With regard to moving a smaller quantity of titrant in contact with analyte, Wixforth teaches movement of both drops toward each other [0041] (for contact), and that control over the amplitudes and pulse operation of the surface waves can be individually set to provide for the well-defined smallest amounts of liquid that can be made to react or mix [0082]. Further, Wixforth teaches that such control of strength of SAWs provides the capability of moving an entire drop of matter from one reservoir to another [0076], or, with greater strength, a smaller portion of material is separated [0077] (an amount of titrant smaller than that of the analyte).

With regard to measuring a characteristic quantity, Wixforth teaches the use of analysis stations on the chip surface in which matter interacts with a measurement quantity, such as illumination, for measurement [0014] with respect to a physical, chemical or biological characteristic [0044].

With regard to repeating steps of moving a drop of titrant to analyte and measuring a characteristic quantity, Wixforth does not teach such repetition of steps. However, the courts have held that duplication of parts in an apparatus has no patentable significance unless a new and unexpected result is produced; *In re Harza*, 274 F.2d 669, 124 USPQ 378 (CCPA 1960). Similarly, applicant does not claim a distinction in the reactions achieved with repetition of steps b) and c) of the method after the first such step. Therefore, it would have been obvious to one of ordinary skill in the art to use repetitive

pulses of surface waves for separating multiple drops of titrant in order to achieve the expected result of incremental and similar sequential reaction of titrant with analyte. With regard to maintaining the analyte drop stationary, while moving titrant for reaction, Wixforth does not teach such step. However, such step is fully with the capability of the method, since Wixforth teaches separate control of transducers for moving analyte and titrant [0076]-[0077]. Further, it would have been obvious to one of ordinary skill in the art, to retain control over movement of analyte from a reservoir to a second fixed site on the chip in order to provide a level of control, separate from that achieved with original positioning of analyte on the chip, over the volume of analyte for use in a reaction with titrant.

For Claim 2, Wixforth teaches use of surface acoustic waves sent to at least one quantity of matter (analyte drop) for mixing (p. 9, Claim 27), after at least two quantities of material are brought into contact (p. 9, Claim 25 and [0054], [0082]).

For Claim 3, Wixforth teaches the process of moving at least two quantities of matter into contact on the solid-body surface, thus moving one quantity (titrant) towards the other quantity (analyte) [0054].

For Claim 4, Wixforth does not specifically teach separation of a drop for performing a titration. Wixforth does teach bringing a quantity of liquid to the chip [0075], at least part of which is to be used as a reservoir for matter (titrant) (p. 10, Claims 46-47) that can be set in motion (is held together) because of surface tension [0076]. Wixforth further teaches that one quantity of the liquid can be separated from the rest [0039], [0046], [0077] and such liquid can be set in motion and moved forward [0047].

From this and the additional teaching of Wixforth that drops can be moved to bring them into contact in this way, it would have been obvious to one of ordinary skill in the art to use such separation and movement to bring a drop separated from a reservoir into contact with a second drop of liquid [0041] (analyte) in order to divide a reaction into multiple steps, a method of configuring a reaction that is well known in the art for providing finer resolution in determination of concentrations of reactants. Further one of ordinary skill in the art would have found desirable such movement of titrant into contact with analyte in order to realize the potential of SAWs on the surface of chips for miniaturizing reactions, according to the teaching of Wixforth.

For Claim 5, Wixforth teaches movement of individual drops (titration quantities) forward [0012] in response to surface waves [0013], and such movement results from the impulse transfer of the surface wave or waves to drops [0006], [0019].

For Claim 6, Wixforth teaches one or more interdigital transducers [0028] that may be used on a piezoelectric substrate (solid surface) [0030], [0048], and that such transducers are used to generate surface acoustic waves [0028] with a direction of emission perpendicular to the axis of the transducer [0028] which can be arranged for waves in the direction of the desired momentum transfer (Figs. 1-5).

For Claim 7, Wixforth teaches bringing a quantity of liquid (analyte) to one or more reservoirs of the chip ([0075], [0077]) and that the chip's surface or parts or regions (analysis point) of the surface may be modulated in wetting properties by coating to define hydrophobic and hydrophilic regions [0021]. Wixforth teaches that

such regions [0072] (analysis point) may be hydrophilic with respect to surrounding region [0071] and will therefore be more strongly wetted.

For Claim 8, Wixforth teaches that a quantity of liquid may be reversibly immobilized (anchored) on the surface of the solid by appropriate functionalization such as imparting different wetting properties than the surrounding surface [0053], such as by defining hydrophobic and hydrophilic regions according to Claim 7 above [0021]. Further, Wixforth teaches that reservoir regions **11** (Fig. 1) are more hydrophilic [0071] than the surrounding region so that matter (reservoir drop) preferentially stays in this region [0072] since it is more strongly wetted than more the hydrophobic surrounding region.

For Claim 9, Wixforth teaches application of liquid sample on the chip **2** [0075] (solid surface), that one quantity of the liquid (titrant) can be separated from the rest ([0046] and [0077]) (reservoir) and that such titrant can be guided from a reservoir on a conducting path formed by surface modulation of wetting properties [0021] to bring it into contact with a reservoir [0077]. Wixforth teaches movement of two drops toward each other [0041] but does not teach movement of titrant to fixed analyte. It would have been obvious to one of ordinary skill in the art (and within the capability of Wixforth's method) to move a single drop toward a fixed second drop in order to affect a reaction, since such single drop movement would require fewer transducers on the substrate for moving liquid drops.

For Claim 12, Wixforth is silent on use of a climatic chamber. It would have been obvious to one of ordinary skill in the art to use a climatic control chamber in order to

maintain volume and prevent drying from the boundaries of very small drops of liquid during and after the time of application of such drops, their movement on the substrate and their interaction with each other for purposes of measuring a reaction.

For Claim 13, Wixforth teaches launching a surface acoustic wave in the direction of an analysis point [0085]. Further, Wixforth teaches matter can be irradiated with a surface wave for the purpose of studying the effect on the surface acoustic wave [0051].

Wixforth is silent on the period of such study, during and/or after the reaction, and on the measurement of parameters of the wave or their change as a result of the interaction. It would have been obvious to one of ordinary skill in the art to use such surface wave, for studying effects throughout and after the reaction in order to obtain data reflecting kinetic properties of the reaction, and that such study on acoustic waves would require choice of parameters of the wave to measure; implicit in such study is measurement of change in a specific property of the wave.

For Claim 14, Wixforth teaches the analysis of matter within at least one region on the surface for at least one physical, chemical or biological characteristic (p. 9, Claim 19). Wixforth does not teach measuring reaction heat. It would have been obvious to one of ordinary skill in the art to use reaction heat as one such physical property, since the free energy of a chemical reaction includes an enthalpic component, that of giving off to or absorbing heat from its surroundings, a parameter readily measurable with calorimetric devices.

For Claim 15, Wixforth teaches the analysis of matter within at least one region on the surface for electric properties (p. 9, Claim 21), but does not specifically teach measurement of electrical conductivity. It would have been obvious to one of ordinary skill in the art to use a measurement of electrical conductivity as one such electric property, since ability to complete an electric circuit owing to the presence of charged analytes in solution, or to the occurrence of an oxidation/reduction reaction, forms the basis for such conductivity.

For Claim 16, Wixforth teaches the analysis of matter within at least one region on the surface for at least one property, including an optical property (p. 9, Claim. 21); however, Wixforth does not specifically teach monitoring a color change. It would have been obvious to one of ordinary skill in the art from such teaching on optical measurement to use color change for measuring a reaction, in order to make use of a readily available parameter based in the absorption/transmission properties of light that can be incorporated into a reaction by use of compounds, such as enzyme substrates, that change color during reaction and can be measured with optical detectors or by eye.

For Claim 17, Wixforth teaches the analysis of matter within at least one region on the surface for at least one physical, chemical or biological characteristic (p.9, Claim 19). Wixforth does not specifically teach measurement of pH. However, it would have been obvious to one of ordinary skill in the art to use measurements of pH changes, as one chemical characteristic that may change and is associated, for instance, with an enzymatic or chemical reaction, and since pH is a numerical parameter representing

concentration of acid (a chemical) in solution that can readily be measured in a microenvironment.

For Claims 18-20, Wixforth teaches that an interdigital transducer may be operated to generate acoustic surface waves, according to an inverse piezoelectric effect, spreading perpendicular to the axis of the transducer [0028]. Wixforth further teaches that such piezoelectric effect can be generated in a substrate if a piezoelectric substrate is used [0030], and that the direction of emission of such waves is controlled by orientating the transducers on the substrate for desired momentum transfer (Figs. 1-4).

Allowable Subject Matter

5. Claims 10-11 and 21-25 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. The following is a statement of reasons for the indication of allowable subject matter: For Claims 10 and 21-22, the prior art of record does not teach or fairly suggest a connection or constriction region **12** or **14** between titrant anchor **3** or analyte drop **1** and a path **18** over which a drop moves, so narrow that it prevents titrant from moving off its anchor point in the absence of an external force. In contrast, Wixforth teaches movement of part of the liquid onto path **5** prior to application of a surface wave [0075] and [0081]. For Claims 11 and 23-25, the prior art of record does not teach or fairly suggest the separation of a quantity of titrant at a contact region **41**, separate from that of the reservoir, such separation

mediated by movement of the reservoir drop across the contact region that is more strongly wetted than the surrounding surface.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to TIMOTHY G. KINGAN whose telephone number is (571)270-3720. The examiner can normally be reached on Monday-Friday, 8:30 A.M. to 5:00 P.M., E.S.T..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jill Warden can be reached on 571 272-1267. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

TGK

/Jill Warden/
Supervisory Patent Examiner, Art Unit 1797